AN UNUSUAL SUBSTRATE FOR POLYSIPHONIA PANICULATA MONTAGNE. Once in a while the curious juxtaposition of circumstances leads to an unusual find. Such a situation occurred during the summer of 1972 when we were exploring the algal communities along the edge of the San Andreas fault, at one of its drowned points. The fault emerges from a land position to follow Tomales Bay some 60 miles northwest of San Francisco. From Tomales Bay the fault lies under Bodega Bay and across Bodega Head, still on a northwesterly line.

We were engaged in field work for the Pacific Marine Station at Dillon Beach, California, and while working the mud flats along the east side of Tomales Bay at a place known as Lawson's Landing came across a rather curious partnership. Here we found a presumably symbiotic partnership between the rhodophycean alga *Polysiphonia paniculata* Montagne and the Horseneck Clam, *Tresus nuttalli* Conrad.

At the time we were collecting macroalgae, various species of *Ulva* being very common on the flats, and as we examined a stand of *Zostera marina* L. in a shallow subtidal area, we found individual plants of *Polysiphonia paniculata* scattered throughout the *Zostera*. Upon grasping the alga it became readily apparent that something unusual was occurring, because the alga would quite noticeably retract into the mud. Small plants would actually vanish from sight, going to depths that made any attempt to collect them futile. The first samples we collected of the alga lacked the lower portions.

Further search among the Zostera revealed another movement; whenever several hunters gathered around one of the *Polysiphonia* plants, it would "settle" downward several centimeters, almost as if it were anticipating our next action. Never having had algae attempt to "get away" before, we concentrated on solving the mystery. After several more misses, we succeeded in getting a whole plant, the trick being for one person to stalk the plant, and moving carefully, to use a long bladed knife to cut through

the mud as deeply as possible below the protruding portion of the plant as the grab for the plant was made.

The cut brought to light a portion of the substrate to which the *Polysiphonia* was attached, and it proved to be the distal portion of the siphon of *Tresus nuttalli*. That the alga was firmly attached to the siphon was quite apparent, and subsequent microscopic examination revealed that the prostrate branches of the *Polysiphonia* had penetrated into the epidermal tissue of the siphon to a depth of several millimeters. Most of the samples we obtained in this manner were evidently from older clams, being 2 plus centimeters in the longest dimension.

Our examination of the general area suggested that the *Polysiphonia* serves to hide the siphon from overhead observation, thus affording some degree of protection to the clam. At no time were we able to see a protruding siphon or any evidence that a siphon was present, although the alga was very evident. We collected during low tide periods, and this did not coincide with the clam's feeding times. As far as we were able to determine over the several acres of flats, the association was confined to the stands of *Zostera*. On the open areas of the flats, heavily dug over by clam diggers, only siphons or siphon holes were to be seen.

We were unable to determine the significance of the association other than on an inferential basis. Generally in this region *Polysiphonia* can be regularly found wherever a firm substrate and tidal flow can be paired. It seemed logical to us that the clam benefited from the position of the alga, and that the alga would in turn benefit from the flow of water into and out of the siphon of the clam. This flow certainly would provide a source of nutrients better than the usual rock or wharf substrate.

A search among specimens in the herbarium at the Station revealed that previous collections of *Polysiphonia* had been made in the same mud flat area, but there was no reference to the type of substrate from which these previous collections were made. Due to the lack of any

other suitable substrate on the flats, we infer that the association we found is not new to this area. *Polysiphonia paniculata* was also collected at the north end of Dillon Beach, but in each instance the substrate was a rock surface slightly buried in sand.

Although *Tresus* is reported to serve as a host for a variety of smaller fauna (Ricketts et al., 1968), we are unaware of any previous reports of an alga living in such a partnership with this clam.

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